tion meant loss of vascular resistance, and that the supposed stimulant was indeed a paralyser of the most active kind.

In turn this reading of the true physiological action of the nitrite of amyl led me safely to its true therapeutical value, and the result was that its exact place in therapeutics was fixed correctly before ever it was used for the treatment and cure of disease. At the meeting of the British Association for the Advancement of Science held at Bath in 1864, I pointed out its therapeutical position. The application of nitrite of amyl as a new remedy for the use of the physician was clear: it was a remedy to be applied in controlling muscular spasm. It was, I said, selecting for my illustration the most terrible and typical of all the spasmodic diseases, it was the remedy even for tetanus or lockjaw, and this view I afterwards demonstrated by the direct experiment of neutralising strychnine tetanus in the frog by the application of the nitrite, of suspending the tetanic symptoms by the agent until the strychnine was eliminated, and of physiologically curing a disease which had been physiologically produced and which, but for the antidote, would have been irrevocably fatal.

So soon as the therapeutical position of nitrite of amyl had been discovered by experiment the practical adaptation of it was comparatively easy. I had only to learn how it had best be administered; how to administer it, by inhalation, by the mouth, by subcutaneous injection; how to make it combine with other medicinal substances, and how to select the most suitable substances with which to join it in combination. The researches in these directions were all conducted on human animals, or rather on one animal—the experimentator himself. The modes of administration were also recorded for the guidance of practitioners, and the remedy was in time fairly launched on a true scientific basis, its action explained, its use described, its effects predicated.

I spent three years in research on the physiological properties of nitrite of amyl in order to discover its place as a means of cure of human maladies. If I had spent thirty years instead of three the time and labour had not been badly repaid. The practical results of my work in the benefit conferred on mankind in mitigation of suffering and in cure of diseases of an intractable nature have been rapid in their course beyond expectation. Dr. Lauder Brunton first tried the application of the nitrite of amyl for the relief of one of the most acutely painful of the spasmodic diseases, the disease known as angina pectoris, and gained an immediate success. Dr. Anstie came to me for the remedy in a case where a man was in the pangs of death from acute spasmodic asthma, and after five minutes of the inhalation of the vapour found his patient breathing with the most perfect freedom, or, as he expressed it to me, "the man became conscious and natural in a few seconds so soon as the physiological action of the remedy took effect; it was like dragging a drowning man out of the water." Dr. Farquharson administered the vapour to a man in excruciating agony from colic, and witnessed the same relief so soon as the physiological effect was produced.

A little later came the application of the nitrite of amyl for the treatment of tetanus, the crucial trial of the agent which I had originally proposed. Mr. Foster, of Huntingdon, was the first surgeon to put it to the test in this disease. A man, after an injury, was seized with tetanus. In the spasmodic grasp of the malady he "was rolled up like a ball." Under the inhalation of the vapour of the nitrite of amyl his muscles relaxed, and whenever the spasm threatened to recur the administration of the vapour of the paralysing agent relaxed the contraction. So for nine days, during which an ounce of the remedy was given by inhalation, the death from the spasm was prevented; by that holding on, the cause of the spasm became inactive, as I had anticipated, and the recovery was secured.

Two other equally successful instances of this same kind have been recorded, and recently Dr. Fowler, of New York, has published a fourth experience identical in character, but with a remarkable additional fact appended. The sufferer who was, as we should once have said, fatally stricken with tetanus, made a primary recovery under the administration of the nitrite of amyl. Unfortunately the supply of the remedy ran out, and before a new supply could be obtained the tetanic spasms returned and continued with increasing violence. At last the remedy was reobtained, and after a lapse of sixty hours was re-administered. The relaxation of the tetanus was again secured, the return of the spasm was controlled over a period of several days, and once more the art of the physiologist was rewarded in the recovery of that stricken patient from one of the most terribly excruciating forms of painful death.

I have put no word of my own experience on the use of nitrite of amyl, long and successful though it has been, on the present record. I have supplied but a few typical facts from the experiences of other observers, and if I could put in all it would be but the record of the uses of a remedy which is as yet but beginning to be applied for the cure of painful diseases not only of men, but of lower animals also, especially of dogs and horses. The point I want to keep in mind is that the results already obtained are the fruits of experimental inquiry. I stood at the gate of the place where this new remedy came from. I took it first as a physician, from the hand of the chemist. I determined its place in medicine. Then other men took it from me, and confirmed my estimate. Thus the history of this remedy is made clear from its beginning, and it is most just to say that if I or some one else, given to like method of research by experiment, had not tested the agent in the same way, the results that have already been obtained from it had been lost. Whether the results are worthy the method—whether, for instance, the experiment of producing and curing tetanus in a frog is warrantable in order to discover a plan by which tetanus induced in man by natural disease can be cured by art—these are the serious kind of questions on which opinion is now divided. It is my duty to show the practical arguments in favour of the experimentation.

BENJAMIN W. RICHARDSON

(*To be continued.*)

NOTES

ON Friday last, in the House of Commons, Mr. Reed asked whether the memorial, already printed in our columns, signed by many of the most eminent men of science in the kingdom in favour of the establishment of a permanent Museum of Science had been presented to the Lord President of the Council; if so, whether he had any objection to laying it upon the table of the House; and whether the Government propose to take any action in the matter.—Lord Sandon in reply stated that he was glad the hon. gentleman had called attention to the important memorial to the Lord President of the Council, which had been signed by, he might almost say, all the most eminent men of science in the kingdom, in favour of the establishment of a permanent Museum of Science at South Kensington. He added that it was one of the many gratifying results of the remarkable exhibition of scientific apparatus which we have had the satisfaction of getting together at South Kensington, with the assistance of the leading men of science both of this country and of almost every civilised State. Lord Sandon promised to at once lay the paper on the table of the House. He was not in a position to say what action will be taken respecting it, but assured the hon. gentleman that it was receiving the best consideration of Her Majesty's Government.

A MOVEMENT at last has been made by Lord Aberdare, late Lord President of the Council, to obtain statistics relating to Secondary Education. On the 4th he asked the Duke of Richmond, the present Lord President, whether he had the means of making a return of the number of schools in England and Wales in which instruction was given to children above thirteen years of age, and if he had not, whether he would take any measure to supply such deficiency. There had been exhaustive inquiry into the universities, public schools, and elementary schools, followed by legislative action, but there had been no inquiry into the state of the schools—such as the endowed schools throughout the country—which occupied a position between the elementary and higher-class schools, and he believed that on inquiry it would be found that large districts were insufficiently supplied with the means of obtaining such education. He knew it would be impossible for the Lord President, however well disposed, to furnish the same amount of information on this subject which would be supplied through the medium of a Royal Commission. We certainly want not only these statistics, but town and country organisations, which are impossible without them.

NO occasion has before drawn together so many distinguished men of science from abroad, in various departments, as the Centennial Exhibitition at Philadelphia. Without attempting to enumerate all who might be mentioned in this relation, *Silliman's Journal* recalls, from Great Britain, Sir William Thomson, the well-known physicist, who is President of the Judges on the XXVth Group—Instruments of Precision and Research; Sir John Hawkshaw, the eminent engineer who was last year President of the British Association; Sir Charles Reed, President of the XXVIIIth Group of Judges—for Education and Science; Capt. Douglas Galton, President of the Judges under the XVIIIth Group—Railway Plans, &c.; Mr. Isaac Lowthian Bell, the most eminent iron metallurgist in Great Britain, and author of the well-known treatise on the "Chemistry of the Blast Furnace," President of the Judges of Group I.—Minerals, Mining, Metallurgy, &c.; Dr. William Odling, Waynflete Professor of Chemistry in the University of Oxford, Secretary of the Board of Judges on Group III—Chemistry and Pharmacy, &c.; from Sweden, Prof. Adolf E. Nordenskjöld, Prof. C. A. Angström, Polytechnic Institute, Prof. O. M. Torrell, Chief of the Geological Survey of Sweden, and Richard Akerman, of the Royal Swedish School of Mines, all from Stockholm, under whose immediate superintendence the excellent geological, mineralogical, and metallurgical display of Sweden, at the Exposition, has been made; from Russia, Major-General Axel Gadoline, an eminent Russian engineer, and Prof. L. Nicholsky, Mining Engineer and adjunct Professor at the Mining School of St. Petersburg, who is in charge of a systematic collection of Russian minerals—the only systematic mineral collection in the Exposition; from Germany, Dr. Wedding, Royal Prussian Counsellor of Mines, Dr. Rudolph von Wagner, the well-known editor of *Wagner's Jahresbericht*, and Dr. G. Seelhorst, of Nuremberg; from France, M. L. Simonin, J. F. Kuhlman (fils), M. E. Levasseur, and M. Emile Guimet, of Lyons; from Italy, Prof. Emanuel Paterno, of Palermo; from Mexico, Mariano Barcena, the mineralogist. The Emperor of Brazil, without claiming the position of a man of science, manifests the most intelligent and cultivated understanding of all that is most worthy of notice in scientific methods, his inquiries extending to everything which should interest the head of a great Continental empire. Prof. Nordenskjöld, on July 1, left on his return to join a new expedition of discovery to the seas of Northern Siberia.

THE number of statues erected by the French to their men of science is fast enlarging. Lately we had to mention the inauguration of M. Elie de Beaumont's monument in Normandy. We learn from the papers of Dauphiné (in the south-east corner) that Grenoble has just rendered the same honour to the celebrated Vaucanson, one of the greatest mechanicians of the last century. It was he who invented the chain for communicating motion at a distance. He used it with an admirable sagacity for constructing the first spinning machine and automata. Vaucanson's automata were deemed a century ago a wonder of the age. He was a candidate for admission to the Academy of Sciences, but was rejected by the influence of the Court party, to whom he was obnoxious. Louis XV. was highly pleased with the result of the election, and he was heard saying, "We will ask him to construct for us an automaton Academician." It was Vaucanson's own collection which formed originally the primitive stock out of which the Conservatoire des Arts et Métiers was grounded.

THE number of visitors to the Loan Collection of Scientific Apparatus during the week ending August 12 was as follows:—Monday, 8,991; Tuesday, 3,458; Wednesday, 424; Thursday, 388; Friday, 359; Saturday, 3,372; total, 16,992.

A NEW geological map of Scotland by Prof. Geikie, Director of the Geological Survey of Scotland, is about to be published by Messrs. W. and A. K. Johnston. It is on the scale of ten miles to one inch, like the tourist map which the same firm published some years ago, and which has been found so useful by all travellers in Scotland. The new map has been engraved with special reference to the requirements of the geologist. It is not too crowded with names, and instead of the old meaningless hill-shading, it has the heights marked by small triangles and reference figures. The geological information includes the most recent observations. The chief lines of dislocation are marked in strong black lines; the general dip of the formations is shown by arrows. In addition to the older rocks, the map shows the position of the more important raised beaches, river alluvia, tracts of blown sand and glacier-moraines. Round the edge of the sheet a series of sections has been engraved to illustrate the geological structure of each great division of the country. We understand that the map is to be ready for the meeting of the British Association next month in Glasgow, and therefore in time for the geological tourists, who will, no doubt, spread themselves over Scotland at the close of the meeting.

WE learn from the *New York Tribune* that Prof. Henry took the opportunity at the last meeting of the National Academy of Sciences, to say a few words about the Smithsonian Institution. Its funds at present, having been increased by donations and judicious management, amount to $717,000, although $600,000 has been expended on the building, and the original legacy produced only $541,000. Congress has enacted several liberal measures which have been of great service to the Institution and have relieved it of many expenses, such as the cost of caring for the grounds and library; and latterly an appropriation of $20,000 per year has cleared the expense of the National Museum. This liberality has enabled the Smithsonian to devote a larger share of its income towards publishing works of original research, and to defray the expense of its system of scientific exchanges, which has the whole world for its field. The publications already issued and under way were enumerated. Prof. Henry said that it was contemplated to authorise a series of experiments to determine accurately the rate of increase of the earth's temperature at progressive depths. This was now rendered more practicable than before by the number of artesian wells in the country. Another project included new and careful experiments on the velocity of light; that furnishing one of the means for ascertaining the distance of the sun. Some steps had been taken to carry out this project, and a gentleman had promised to give a special fund for the purpose. The work of obtaining accurately the weight of the earth by the method devised by Cavendish would also probably be undertaken anew, there being at the present day better means for this purpose than those of the old experiments. Prof. Henry alluded to his own advancing years and his anxiety to have the Smithsonian in a position of permanent security before the close of his life. The accumulations of the museum already overstock the building, and when the collections that have been sent to Philadelphia are returned there will be no room for them. Conversing on the subject with a prominent member of Congress, he had recently stated his firm conviction that the problem could best be solved by abandoning the present building to the National Museum and erecting a new structure, to cost $100,000. The new building could be adapted solely to the needs of the Smithsonian in its proper work, and should contain besides accommodation for the system of exchange, a chemical, a physical, and a biological laboratory with a lecture-room.

Messrs. Williams and Norgate have sent us the following new foreign publications:—"Die Dynamite, ihre Eigenschaften und Gebrauchsweise sowie ihre Anwendung in der Landwirthschaft und im Forstwesen," by Isidor Trauzl (Berlin, Wiegand and Co.); "Die Leitungsbahnen in Gehirn und Rückenmark des Menschen, auf Grund Entwickelungsgeschichtlicher Untersuchungen," by Dr. Paul Flechsig (Leipzig, Engelmann); "Studien über die ersten Entwickelungsvorgänge der Eizelle die Zelltheilung und die Conjugation der Infusorien," by O. Bütschli (Frankfurt, Ch. Winter).

In a reference to Bessels' *Protobathybius*, in Nature, vol. xiv., p. 238, the statement is made that it has not been described and figured. This, it would appear, is erroneous, for Mr. A. S. Packard, jun., of Salem, Mass., has published a drawing and brief description of it, furnished to him by Dr. Bessels, in his little work entitled "Life Histories of Animals, including Man," which appeared a few months since.

The following is the title of the essay to which the Howard medal of the Statistical Society will be awarded in Nov. 1877 (the essays to be sent in on or before June 30, 1877). "On the condition and Management—past and present—of the Workhouses and similar Pauper Institutions in England and Wales, and their effect on the Health, Intelligence, and Morals of the Inmates." Further particulars at the rooms of the Society in Somerset House Terrace, Strand, W.C.

Mr. Charles Darwin has been elected an Honorary Vice-President of the Birmingham Natural History Society.

With regard to the statement in our recent paper on Oyster Fisheries, that some fix three, others four, years as the age at which an oyster becomes reproductive, Mr. W. Fell Woods, a Director of the South of England Oyster Company, writes us that it has been known to many that oysters breed when two years old, and in the course of his own investigations (as stated in his evidence before the Select Committee), he had found them to spat when twelve months and *even barely* twelve months old. The conditions then have, no doubt, been somewhat exceptional, whilst at two years it is comparatively frequent.

The Abstracts of Meteorological Observations made in New Zealand during 1875 have come to hand. They show for fourteen places the monthly results of pressure, temperature, humidity, rain, wind, and cloud, compared with previous years' averages, together with notes descriptive of the general character of the weather and the unusual phenomena at each station, and a rapid and graphic summary for the whole of New Zealand, the earthquakes being specially recorded. The publication might be made still more valuable if pressures were given not reduced to sea-level, if the methods of computing the different averages were clearly stated, and if some of the more important results were also published for different hours.

In the June number of the *American Journal of Science and Arts*, there appears a short article on "The Curve of Eccentricity of the Earth's Orbit," by Mr. R. W. McFarland, of the Ohio Agricultural and Mechanical College, Columbus. Mr. McFarland has performed the self-imposed task—one of great labour—of testing the accuracy of the tables given by Mr. Croll and by Mr. Stockwell. Mr. Croll, it will be remembered, computed the values by Le Verrier's formulæ, and Mr. Stockwell by formulæ of his own. Mr. McFarland has now re-computed the values by Le Verrier's formulæ, and finds "Croll's figures correct in most cases, and not in error to the amount of ·001, except in one instance."

The operations of the United States Fish Commission in the way of stocking the Connecticut and other rivers of the United States with shad, promise to be very successful during the present season, unless the great heat should bring up the temperature of the water to such a degree as to interfere with the proper hatching of the eggs. More than a million and a half of eggs were taken during the first week of the work, and a large number of the fish therefrom were placed in the river at Bellows Falls. As the hatching establishment is below the Holyoke Dam, the fish are introduced above it, so that in their return from the sea they may proceed up the fish-way to their starting-point, instead of remaining below it, as would otherwise be the case.

It appears from reports brought from Iceland and the north by Capt. Ambrosen, of the *Arcturus*, that boisterous weather has been experienced within the whole navigable portion of the Arctic circle, the high winds driving the field-ice southward in large quantities. It is thence inferred that the ice within the polar basin has been broken up to a larger extent than usual, thus probably favouring the Arctic Expedition in carrying out its objects.

The ninth annual report of the trustees of the Peabody Museum of American Archæology and Ethnology, presented in April of the present year, has been published, and gives an account of the additions to this extremely extensive and important collection. Since the death of the lamented Prof. Jeffries Wyman, the museum has been under the charge of Prof. F. W. Putnam, who has continued the cataloguing and arrangement begun by his predecessor, and brought the whole establishment to a condition of thorough efficiency. Many valuable additions are recorded during the year, the most important, and, indeed, the largest donation ever made to the museum, being that from Peru and Bolivia, collected at the expense of Mr. Alexander Agassiz, and presented by him, embracing nearly six hundred specimens. These consist largely of objects from the ancient burial-places at Anton, Chancay, Pasagua, Pacasmayo, and the island of Titicaca. The total number of additions to the museum amounts to over eleven hundred specimens. The report as published contains a general index to the nine annual reports of the museum, which are arranged to form volume one of the collective series. It is accompanied by portraits of Mr. George Peabody and Prof. Wyman.

The additions to the Zoological Society's Gardens during the past week include a Grizzly Bear (*Ursus ferox*) from California, two Black Iguanas (*Metopoceros cornutus*) from San Domingo, purchased; two Booted Eagles (*Aquila pennata*), three Common Bustards (*Otis tarda*) European, a Leopard Tortoise (*Testudo pardalis*) from Port Elizabeth, deposited; five Gold Pheasants (*Thaumalea picta*), an Amherst Pheasant (*Thaumalea amherstiæ*), a Siamese Pheasant (*Euplocamus prælatus*), a Crested Pigeon (*Ocyphaps lophotes*), a Porto Rico Pigeon (*Columba corensis*), bred in the gardens.